tions of the intermediate and large ions were obtained on many occasions, but with vapour pressures exceeding seventeen millimetres, while the observations of the large ion were equally good, all trace of the intermediate ion disappeared.[1] Disintegration of the ion at a critical vapour pressure is unlikely, and it is much more probable, assuming a rigid nucleus, that the adsorbed fluid is in the condition of a dense vapour, and that at the critical pressure it changes its state to that of a liquid, like the moisture adsorbed by glass and shellac in Trouton's experience.

Such a change means a decrease in the energy of the aggregation, and is to be expected when the molecules of water vapour around the nucleus become sufficiently closely packed. The advent of a liquid surface involves a diminished rate of molecular escape; rapid condensation will therefore occur, with a decreasing unit-surface energy, until further increase in the size of the ion means an increase in the total energy of the mixture of ions and vapour. The final result is no other than the large ion. The assumption of a rigid core for the intermediate ion appears, thus, to be justified.

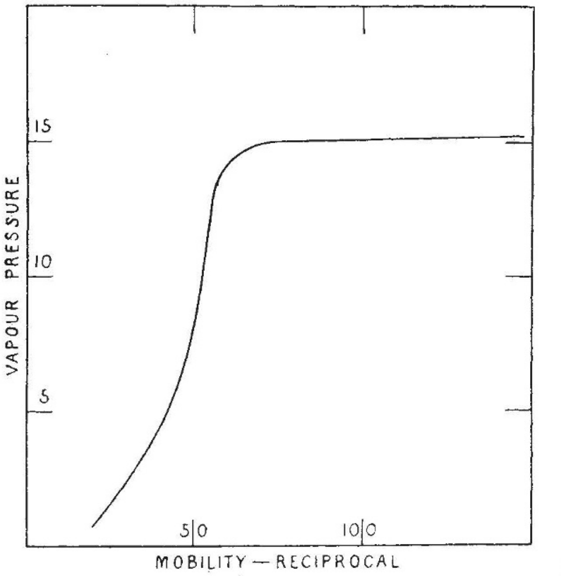

Fig. 2.—The relation between the reciprocal of the mobility of the intermediate ion and the vapour pressure.

To sum up the whole evidence, the large ion consists of a rigid nucleus surrounded by moisture in the liquid condition, the size of the drop at constant temperature depending on the vapour pressure. The intermediate ion is to be considered as a similar nucleus enveloped by a dense atmosphere of water vapour. The mass of the ion increases with the vapour pressure, until at a critical pressure the adsorbed fluid assumes the liquid state, and the aggregation develops, by the rapid condensation which ensues into the large ion of Langevin.

It is not quite clear how the electrical energy of the ions is related to their diameter. The charge is, however, not essential to the equilibrium of molecular structures such as those just mentioned, and it is not unlikely that the conclusions as to the nature of the ions, only rendered possible by the happy chance of their electrification, may apply with, perhaps, little modification to the far more numerous class of unelectrified nuclei which exists in ordinary air.

University of Sydney. J. A. Pollock.

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[1] Details of these observations will be found in two papers published in the *Philosophical Magazine* for April and May, 1915.

Similitude in Periodic Motion.

It may interest those of your readers whose attention has been direction to periodic motion to know that by reducing extremely large and extremely small frequencies to a musical base, and employing the middle C (256) as a standard the following results are obtained:—

Green light (frequency $5\cdot6\times10^{14}$) corresponds to the note C in the forty-first octave above the standard.

The colours—orange, green, and violet—roughly correspond to the musical chord ACE.

Human heart-beats (seventy-five a minute) correspond to the note E (320) in the eighth octave below the standard.

The earth's daily rotation corresponds to the note G (384) in the twenty-fifth octave below the standard.

Neptune's sidereal period almost corresponds with E flat (422) in the forty-first octave below the standard.

Herbert Chatley.

Tangshan Engineering College, Tangshan,
North China, March 17.

A Simple Direct Method for the Radius Curvature of Spherical Surfaces.

The following device was developed to obtain the radius of curvature of some lens surfaces that were too small for the available spherometers. It has proved so satisfactory that, not finding it in any of our laboratory manuals, it has been thought to be of possible interest to others.

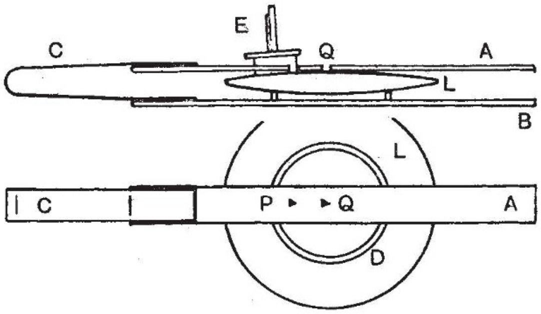

Fig. 1.

Two brass strips, A and B (Fig. 1), are connected by a flat spring, C. To B is soldered a brass ring, D, to serve as a bed for the lens, L, the surface of which is to be examined. A is pierced with two triangular holes, P and Q, as indicated in the sketch, the forward one having its vertex over the centre of the ring. A three-legged optical lever, E, is set with its legs on the glass surface, the front leg being as far forward as possible in one of the triangular holes, P (as shown). The other legs straddle the strip A, one being in contact with A. The lever E is not shown in the lower sketch.

If the mirror be lifted from its position in P to a similar one in which the front leg is at the vertex of Q, it will have been given a linear displacement (s) and an angular displacement (θ). The former of these quantities is the same as the distance between the vertices of P and Q. It is a constant of the instrument, and may be determined by means of a travelling microscope. The angular displacement (θ) depends on the lens surface, and may be obtained by telescope and scale in the usual way. The radius of curvature is then written by $\rho=s/\theta$.

The vertex of Q is placed over the centre of the ring, as this is the simplest way to ensure that the displacement lies along a great circle of the surface.

Will C. Baker.

Physical Laboratory, Queen's University,
Kingston, Ont., April 19.